

REMARKS/ARGUMENTS

Claims 1-2, 7-9, 11-13, and 15-16 are pending in the Application. Claims 1-2, 7-9, 11-13, and 16 are currently amended. Claims 17-18 are cancelled. Claim 15 has been withdrawn from further consideration by the Examiner as a result of a restriction requirement.

Currently amended Claims 1-2, 7-9, 11-13, and 16 are now all directed to a heat exchanger for a seawater desalination plant which comprises the recited titanium alloy material. Support therefore is found in the Specification at page 1, 1<sup>st</sup> and 2<sup>nd</sup> full ¶¶; page 4, 1<sup>st</sup> full ¶, page 17, 2<sup>nd</sup> full ¶.

The current amendments to Claims 1 and 2 now specify mass% units for all element percentages, as the Examiner required in the Office Action dated March 17, 2010 (OA), page 4, 1<sup>st</sup> full ¶. Support therefore is found in original Claim 1 wherein “%” is defined as “mass%, hereafter . . . in chemical compositions” and in the Specification at page 4: “(hereafter, all chemical components are expressed in terms of mass%).”

Claim 1 also has been amended to limit the lower and upper extremes for the range of average Al concentration in the Al concentration layer and the range of Al content between the Ti-Al alloy and the oxide layer to 0.8-6 mass%. Support for both ranges is found in the Specification at pages 11-12, bridging paragraph. Accordingly, Claims 17-18 have been cancelled.

Previously presented Claim 11 has been amended to change the range of average Al concentration in the Al concentration layer from “3.45-25 mass%” to 3.45-5.92 mass%. Support therefore is found in Table 3, Examples 53-54, at page 20 of the Specification.

Applicant respectfully requests entry of the current amendments to the claims and reconsideration of the final rejections as inapplicable to currently amended Claims 1-2, 7-9, 11-13, and 16.

Rejections of Claims 1-2, 7-9, 11-13 and 16 under 35 U.S.C.  
112, 1<sup>st</sup> ¶, for non-compliance with its written description requirement

Previously presented Claims 1-2, 7-9, 11-13 & 16-18 were rejected under 35 U.S.C. 112, 1<sup>st</sup> ¶, for non-compliance with its written description requirement, i.e., for new matter (OA, p. 3, ¶ 2). The Examiner found (OA, p. 3, ¶ 2):

Claims 1, 17, and 18 recite the Al content between the Ti-Al alloy and the oxide layer is 25%, 16%, and 6% or less, respectively. These ranges include the range of zero percent to less than 0.8%, which is new matter because the original specification provides no support for such a range.

Currently amended Claim 1 is drawn to a heat exchanger for a desalination plant which comprises a titanium alloy material, wherein the titanium alloy material comprises a Ti-Al alloy comprising 0.50 - 3.0 mass% of Al (Spec., Abstract; p. 6, 2<sup>nd</sup> and 3<sup>rd</sup> ¶¶; p. 11, 3<sup>rd</sup> full ¶), an oxide film on the Ti-Al alloy, and an Al concentration layer between the Ti-Al alloy and the oxide layer, wherein

- (1) the Al concentration layer has an average Al concentration in a range of from 0.8-6 mass%;
- (2) the Al content between the Ti-Al alloy and the oxide layer is 0.8-6 mass%; and
- (3) the Al concentration of the Al concentration layer is 0.3 mass% or more higher than an Al concentration of the Ti-Al alloy.

Written support for the Al content range of 0.8-6 mass% between the Ti-Al alloy and the oxide layer is found in Applicant's Specification at pages 11-12, bridging ¶ (emphasis added):

The lower limit of the Al content in the Al concentration layer is approximately 0.8% from the minimum difference between the lower limit of the Al content of the bulk part and the Al amount of the bulk part. However, if the Al content of the Al concentration layer exceeds 25%, a very brittle  $\gamma$  phase based on Ti-Al is produced, and the surface layer (Al concentration layer and oxide film) easily cracks and peels during working. . . . For this reason, it is desirable to suppress the Al content of the Al concentration layer to 25% or less. Further, it is preferably 16% or less which is the component range wherein a  $\epsilon$  phase is not produced, and more preferably 6% or less which is the component range at which an  $\alpha_2$  phase (Ti<sub>2</sub>Al) is not produced.

Regardless of the phase, the lower limit of the Al content in the Al concentration layer is always approximately 0.8%.

The written description requirement of 35 U.S.C. 112, 1<sup>st</sup> ¶, is prima facie satisfied when the supporting specification describes the claimed subject matter in a manner which reasonably would have suggested to a person skilled in the art that the inventor in fact invented that subject matter claimed. Stated another way, the written description requirement of 35 U.S.C. § 112, 1<sup>st</sup> ¶, is satisfied if the specification reasonably conveys to one skilled in the relevant art that the inventor had possession of the claimed invention at the time the application was filed. *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64 (Fed. Cir. 1991)(the specification must convey with reasonable clarity that the applicant invented the subject matter claimed).

In light of the teaching in the Specification at page 11-12, bridging paragraph, the current amendments to Claim 1 consistent therewith, and cancellation of Claim 17-18, the Examiner's final rejection of previously presented Claims 1-2, 7-9, 11-13 and 16 under 35 U.S.C. § 112, 1<sup>st</sup> ¶, should be withdrawn.

Rejections of Claims 1-2, 7-9, 11-13 and 16 under 35 U.S.C. 112, 2<sup>nd</sup> ¶, as indefinite for failing to particularly point out and distinctly claim the invention

Previously presented Claims 1-2, 7-9, 11-13 and 16-18 were rejected under 35 U.S.C. 112, 2<sup>nd</sup> ¶, as indefinite for failing to particularly point out and distinctly claim the subject matter Applicant regards as the invention (OA, p. 3, ¶ 4). As applied to Applicant's currently amended claims, the rejections should be withdrawn.

The Examiner concluded that the previously presented claims were vague and indefinite because the Al content between the Ti-Al alloy and the oxide layer is "25%, 16%, and 6% or less," i.e., allegedly including "zero percent to less than 0.8%", and yet the "average Al concentration [is] . . . 0.8-25%" in the Al concentration layer between the Ti-Al alloy and the oxide layer. Thus, the Examiner found that the ranges for Al content and

average Al concentration were inconsistent and concluded that the claims were indefinite therefore.

Currently amended Claim 1 is drawn to a heat exchanger for a desalination plant which comprises a titanium alloy material, wherein the titanium alloy material comprises a Ti-Al alloy comprising 0.50 - 3.0 mass% of Al (Spec., Abstract; p. 6, 2<sup>nd</sup> and 3<sup>rd</sup> ¶¶; p. 11, 3<sup>rd</sup> full ¶), an oxide film on the Ti-Al alloy, and an Al concentration layer between the Ti-Al alloy and the oxide layer, wherein

- (1) the Al concentration layer has an average Al concentration in a range of from 0.8-6 mass%;
- (2) the Al content between the Ti-Al alloy and the oxide layer is 0.8-6 mass%; and
- (3) the Al concentration of the Al concentration layer is 0.3 mass% or more higher than an Al concentration of the Ti-Al alloy.

Express support for the Al content range of 0.8-6 mass% between the Ti-Al alloy and the oxide layer is found in Applicant's Specification at pages 11-12, bridging ¶ (emphasis added):

The lower limit of the Al content in the Al concentration layer is approximately 0.8% from the minimum difference between the lower limit of the Al content of the bulk part and the Al amount of the bulk part. However, if the Al content of the Al concentration layer exceeds 25%, a very brittle  $\gamma$  phase based on Ti-Al is produced, and the surface layer (Al concentration layer and oxide film) easily cracks and peels during working. . . . For this reason, it is desirable to suppress the Al content of the Al concentration layer to 25% or less. Further, it is preferably 16% or less which is the component range wherein a  $\epsilon$  phase is not produced, and more preferably 6% or less which is the component range at which an  $\alpha 2$  phase ( $\text{Ti}_2\text{Al}$ ) is not produced.

As currently amended, the ranges for the average Al concentration in the Al concentration layer and the Al content in the Al concentration layer are both 0.8-6 mass%. Accordingly, there no longer appears to be any inconsistency between the respective ranges.

Applicant's claims need only reasonably apprise those skilled in the art of their scope. *Hybritech Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1385 (Fed. Cir. 1986). Thus,

the language of Applicant's currently amended claims, when properly interpreted in light of the specification, is not indefinite or ambiguous. Compare *Allen Archery, Inc. v. Browning Manufacturing Co.*, 819 F.2d 1087, 1092-93 (Fed. Cir. 1987), and *Texas Instruments Inc. v. U.S. Int'l Trade Comm'n*, 871 F.2d 1054, 1063 (Fed. Cir. 1989). In light of the currently amended claim language itself and the teaching in the Specification, there should no longer be any doubt that Applicant's claims would reasonably have apprised those skilled in the art of their scope.

Additionally, as requested by the Examiner, "%" is now defined throughout Applicant's claims as "mass%". Support therefore is found in original Claim 1 wherein "%" is defined as "mass%, hereafter . . . in chemical compositions" and in the Specification at page 4: "(hereafter, all chemical components are expressed in terms of mass%)."

Rejections of Claims 1, 2, 7, 9, 11-13, and 16-18 under 35 U.S.C. 103

Previously presented Claims 1, 2, 7, 9, 11-13, and 16-18 were rejected under 35 U.S.C. 103 over Miyamoto (EP 1126139 A2, published August 22, 2001) in view of Grunke (U.S. Patent 4,936,927, issued June 26, 1990), Lütjering (Lütjering et al., *Titanium*, Springer-Verlag, Berlin, 2003; pp. 48-49, para. 2.9.3; Fig. 2.32), and Yao (U.S. Patent 6,066,359, issued May 23, 2000)(OA, pp. 5-6, ¶ 8). In light of the current amendments to Applicant's claims, and for the reasons stated hereinafter, the rejections should be withdrawn.

In the titanium alloy material which forms the heat exchanger for a seawater desalination plant currently claimed, the Al content between the inner Ti-Al alloy and the outer oxide film is 0.8-6 mass%. When the Al content between the inner Ti-Al alloy and the outer oxide film is significantly higher, the middle Al concentration layer and/or the outer oxide film tends to become brittle and crack and/or peel. When this happens, the surface layers cannot block hydrogen diffusion into the innermost Ti-Al alloy and prevent the problems resulting therefrom. Consequently, it is most desirable to suppress the Al content

of the middle Al concentration layer to prevent formation of any brittle phase (Spec., pp. 11-12, bridging ¶).

Hydrogen is generated due to corrosion of steel parts. Accordingly, when a prior art titanium alloy material comes in contact with steel in a heat exchanger for a seawater desalination plant, the titanium alloy material tends to become brittle and crack or peel (Spec., p. 2, 2<sup>nd</sup> and 3<sup>rd</sup> ¶¶; p. 3, 1<sup>st</sup> full ¶). Titanium alloy materials for heat exchangers used in seawater desalination plants generally do not require high oxidation resistance because they are used in low temperature environments involving a water supply and/or water recirculation (Spec., p. 17, last ¶), i.e., less than 150°C,. The currently claimed heat exchanger for a seawater desalination plant which comprises the specifically defined titanium alloy material has superior hydrogen absorption resistance in a harsh, low temperature environment.

In contrast, Miyamoto and Grunke describe titanium alloy materials suitable for use in high temperature environments where high temperature oxidation of the titanium alloy material is a serious problem and hydrogen absorption is not. See Grunke's teaching that the problematic diffusion of oxygen into its titanium alloy materials begins at about 550-600°C (Grunke, col. 1, ll. 23-32).

Miyamoto describes a Ti-Al alloy having superior heat-resistance and oxidation-resistance (Miyamoto, Abstract) for use as automobile mufflers [0001-0002]. Miyamoto's Ti-Al alloy must be oxidation resistant at temperatures of about 700°C [0004]. Miyamoto's superior heat-resistant and oxidation-resistant Ti-Al alloy comprises 0.5-2.3 mass% Al. However, Miyamoto does not mention resistance to hydrogen diffusion or deterioration caused by hydrogen diffusion and/or absorption. Nor does Miyamoto teach that its Ti-Al alloy is or should be covered by an outer oxide film or a surface layer which comprises a high Al concentration layer and an outer oxide film. Therefore, the Examiner has combined

Grunke's teaching to apply a high Al concentration layer directly over a Ti-Al alloy and Lütjering's teaching that  $\text{Al}_2\text{O}_3$  and crystalline  $\text{TiO}_2$  naturally form on a Ti-Al alloy when exposed to air. The Examiner further relies on Yao for its teaching to form a titanium oxide film over either a metal, ceramic, or polymeric substrate to protect the substrate from oxidation and corrosion caused by oxidation. Based on all the combined teachings, the Examiner concludes that Applicant's currently claimed low temperature heat exchanger for a seawater desalination plant which comprises a hydrogen-resistant titanium alloy material would have been *prima facie* obvious to a person having ordinary skill in the art. Nevertheless, the Examiner appears to recognize that the combined prior art references still do not reasonably the titanium alloy material described in Applicant currently claims.

We reemphasize the fact that Applicant now claims a heat exchanger for seawater desalination plants wherein environmental temperatures no greater than  $150^\circ\text{C}$  exist. On the other hand, Miyamoto is interested in titanium alloy materials for use as high temperature-resistant ( $700^\circ\text{C}$  [0004]) and oxidation-resistant mufflers [0001-0002], and Grunke is interested in titanium alloy materials for use as high temperature-resistant ( $550\text{-}600^\circ\text{C}$ ; Grunke, col. 1, ll. 23-37) and oxidation resistant aircraft power plants (Grunke, col. 1, ll. 23-37). Heat exchangers for seawater desalination plants do not operate at the high temperatures at which the Ti-Al alloy materials disclosed by Miyamoto and Grunke are designed to function. Accordingly, there reasonably would have been no suggestion, incentive, or motivation to make and use the Ti-Al alloy materials taught by Miyamoto and Grunke to resist hydrogen absorption by a Ti-Al alloy material in the significantly lower temperature, aqueous environments Applicant currently claims.

Nevertheless, the Examiner argues that (OA, p. 5, last ¶; emphasis added):

- (1) Grunke teaches that "the aluminum concentration and distribution of the aluminum within the diffusion zone is a result-effective variable because it would

- directly affect the oxidation resistance of the material as well as mechanical properties such as stiffness and ductility (col. 3, lines 1-11; col. 4, lines 10-15)”;
- (2) “[I]t would have been obvious . . . [to optimize] the aluminum concentration and distribution of aluminum in the diffusion layer in order to achieve desired oxidation resistance and mechanical properties”; and
- (3) “[A]n amount of aluminum more dilute than the individual lamellar amounts of 53.0%, 36.0%, and 15.8% by mass in the  $\text{TiAl}_2$ ,  $\text{TiAl}$ , and  $\text{Ti}_3\text{Al}$  layers would not only be possible but also necessarily occur for longer diffusion heat treatment times.”

Grunke forms a layer of higher Al concentration over a Ti-Al alloy but the Al content in that layer is not close to the currently claimed range from 0.8-6 mass%. Grunke also does not teach that the higher Al concentration layer comprises an outermost protective oxide film formed on the Ti-Al alloy. The Examiner calculates (Office Action dated October 5, 2009, p. 7; *Calculation of Percentage Al in Various Ti and Al Compounds*) that Grunke’s higher Al concentration layer has a  $\text{TiAl}_2$  layer between the Ti-Al alloy and a naturally forming oxide layer with an Al content of approximately 53.0%, a  $\text{TiAl}$  layer between the Ti-Al alloy and a naturally forming oxide layer with an Al content of approximately 36.0%, and a  $\text{Ti}_3\text{Al}$  layer between the Ti-Al alloy and a naturally forming oxide layer with an Al content of approximately 15.8%. Based on those calculations, the average Al concentration of Grunke’s higher Al concentration layer appears to be approximately 35%, which is at least 10% higher than the highest average Al concentration allowed in the Al concentration layer of Applicant’s previously presented Claim 1 and at least 29% higher than the highest average Al concentration allowed in the Al concentration layer of Applicant’s currently amended claims.

The lowest Al content in Grunke’s higher Al concentration layer is not close to the maximum Al content of 6 mass% in Applicant’s currently amended claims. Applicant’s



Specification teaches that the Al content between the Ti-Al alloy and the oxide layer cannot exceed 25% or cracking, peeling, and hydrogen diffusion and absorption will result and deterioration of the Ti-Al alloy will occur (Spec., pp. 11-12, bridging ¶). Applicant's Specification also teaches that the most desirable Al content between the Ti-Al alloy and the oxide layer is the currently claimed 0.8-6 mass%. At that low Al content, little or no cracking, peeling, and hydrogen diffusion and/or absorption will result, and little or no deterioration of the Ti-Al alloy due to hydrogen diffusion and/or absorption will occur (Spec., pp. 11-12, bridging ¶).

Grunke's higher Al concentration layer protects its Ti-Al alloy against embrittlement due to high temperature oxidation (Grunke, col. 3, ll. 1-12). Grunke teaches (Grunke, col. 3, ll.52-61):

The phase first formed is normally  $\text{TiAl}_3$ . The phases formed in the second step are, for example,  $\text{TiAl}_2$ ,  $\text{TiAl}$ , and  $\text{Ti}_3\text{Al}$ . . . . The aluminum content thus diminishes in a stepwise manner from the surface in the direction toward the core of the structural component.

Grunke's Figure 2a shows the distribution of Al content through the Al concentration layer (Grunke, col. 6, ll. 16-26; emphasis added):

FIG. 2a illustrates a coating on a structural component which has been prepared as a result of a short duration diffusion treatment or diffusion annealing in which a number of layers having different intermetallic phases have been formed. For example, the outermost surface layer to the left in Fig. 2a is a  $\text{TiAl}_2$  layer, the next layer inwardly is a  $\text{TiAl}$  layer. The third layer is a  $\text{Ti}_3\text{Al}$  layer, and the fourth layer includes the titanium aluminum mixed crystal. As a result, the aluminum content diminishes from the outer surface inwardly in steps as shown at 2 in FIG. 2b.

Despite Grunke's teaching away from the low Al content in middle layer of the titanium alloy material of the claimed heat exchanger, the Examiner argues that persons having ordinary skill in the art would have been motivated to conduct longer heat treatment times "to obtain a titanium part with relatively few abrupt changes in properties as ideally shown in Fig. 3a" (OA, p. 6, 1<sup>st</sup> ¶, last sentence) and a substantially reduced Al content in Grunke's high Al concentration layer. Even assuming that the layers in Grunke's Fig. 2a

might include one with an Al content of 0%, the average Al concentration of Grunke's four layers between the Ti-Al alloy and the oxide layer still appears to be approximately 26%, i.e., much higher than the maximum Al content of 6 mass% required between the Ti-Al alloy and the oxide layer of the Ti-Al alloy material which forms the heat exchanger of Applicant's currently amended Claim 1. Moreover, even though Grunke teaches that an even distribution of (Ti + Al) - Mixed Crystal (Fig. 3a) or a "gradual decrease of the aluminum content from the surface toward the center of the structural component . . . is most desirable" (Grunke, col. 6, ll. 27-34) and that prolonged heat treatment is required "to obtain a titanium part with relatively few abrupt changes in properties as ideally shown in Fig. 3a" (OA, p. 6, 1<sup>st</sup> ¶, last sentence), nowhere does Grunke reasonably suggest that the even distribution of (Ti + Al) - Mixed Crystal shown in Fig. 3a or the desirable gradual decrease of the aluminum content from the surface toward the center of the structural component (Grunke, col. 6, ll. 27-34) would result in the Al content of 0.8-6 mass% which is required between the Ti-Al alloy and the oxide layer in Applicant's currently amended Claim 1. Moreover, persons having ordinary skill in the art reasonably would have expected that the Al content of the Al concentration layer between the Ti-Al alloy and the oxide layer would remain substantially the same whether or not it is evenly distributed throughout the higher Al concentration layer or not.

The Examiner's argument that it would have been obvious to persons having ordinary skill in the art to lower the Al concentration of the Al within the distribution zone and thus optimize the oxidation resistance runs counter to Grunke's teaching. Grunke teaches that "[t]he aluminum diffuses into the titanium alloy to form a protective coating. As a rule, such coating comprises the intermediate phase  $TiAl_3$ " (Grunke, col. 1, l. 67, to col. 2, l. 2). Persons having ordinary skill in the art reasonably would have expected from Grunke's teaching that a higher Al content in the protective Al concentration layer rather than a lower

Al content therein would provide optimum protection. Moreover, persons having ordinary skill in the art reasonably would not necessarily act to optimize oxidation resistance in the low temperature environment of the currently claimed heat exchanger for a seawater desalination plant where high temperature oxidation problems rarely occur.

Grunke is not interested in protecting against hydrogen diffusion and/or hydrogen absorption by Ti-Al alloy materials used in low temperature environments. Therefore, persons having ordinary skill in the art would not have been led by Grunke's teaching to determine that Ti-Al alloy materials require an Al concentration of from 0.8-6 mass% between the Ti-Al alloy and any naturally forming oxide film to protect against hydrogen diffusion and/or hydrogen absorption. Grunke is interested in providing oxidation protection in high temperature environments which requires a protective high Al concentration layer with a significantly higher Al content. There would have been no motivation whatsoever for persons having ordinary skill in the art to reduce the Al content of the Al concentration layer of Ti-Al alloy materials used in low temperature seawater desalination plants to optimize protection against high temperature oxidation conditions. High temperature oxidation conditions are NOT presented.

Lütjering and Yao do not support the Examiner's case for obviousness based on optimization at all. Miyamoto and Grunke seek to improve the high temperature oxidation resistance of a Ti-Al alloy. Lütjering suggests that oxidation resistance is optimized by increasing the aluminum concentration to around 40 at% Al (Lütjering, pp. 49-50, bridging ¶):

The improved oxidation resistance of titanium aluminides, such as  $Ti_3Al$  or  $\gamma$ -TiAl based alloys, results from an increased volume fraction of  $Al_2O_3$  in the scale (Fig. 2.32). The amount of  $Al_2O_3$  increases with aluminum concentration and the  $Al_2O_3$  layer becomes continuous around 40 at% Al. Consequently,  $\gamma$ -TiAl exhibits a better oxidation resistance than alloys based on  $Ti_3Al$ .

Persons having ordinary skill in the art would have learned from Lütjering's teaching to increase the Al content between Grunke's Ti-Al alloy and any naturally formed oxide layer to improve the oxidation resistance of a Ti-Al alloy. Persons having ordinary skill in the art reasonably would never have reduced the Al content of the Al concentration layer to 0.8-6 mass% to improve oxidation resistance in a low temperature environment.

Furthermore, Yao achieves oxidation resistance by forming a thin titanium oxide layer on a metallic surface. Lütjering teaches that  $\text{TiO}_2$  is not stable on titanium alloys at high temperatures (Lütjering, pp. 49-50, bridging ¶). And, Yao's titanium oxide layer is not produced by oxidizing a Ti-Al alloy and therefore does not form the outer oxide film required by Applicant's claims. Yao's titanium oxide layer is formed from a solution containing titanium fluoro complex compounds.

Persons having ordinary skill in the art might reasonably have suspected that the high temperature oxidation resistance of Miyamoto's Ti-Al alloy could be improved by forming an Al concentration layer on the Ti-Al alloy. However, Lütjering would have taught persons having ordinary skill in the art NOT to decrease the Al content of the Al concentration layer substantially below 40 at% (Lütjering, pp. 49-50, bridging ¶). Therefore, persons having ordinary skill in the art would not have sought to reduce the Al content between the Ti-Al alloy and the surface oxide film to 0.8-6 mass% as Applicant's currently amended claims require to protect against deterioration caused by increased hydrogen diffusion and/or absorption in a low temperature environment.

Finally, even if the Examiner's unsupported finding that an Al content of 25 mass% between the Ti-Al alloy and the surface oxide film would "necessarily occur" by prolonging Grunke's heat treatment (OA, p. 6, 1<sup>st</sup> full ¶), there is no evidence which would have led a person having ordinary skill in the art to believe that an Al content of 0.8-6 mass% between the Ti-Al alloy and the surface oxide film would "necessarily occur" by prolonging Grunke's

heat treatment. The Examiner also finds that the “product suggested by the prior art would inherently possess hydrogen absorption resistance properties” (OA, p. 7, 1<sup>st</sup> full ¶).

Applicant’s currently claimed heat exchanger for a seawater desalination plant comprises a titanium alloy material wherein the Al content between the Ti-Al alloy and the oxide layer is 0.8-6 mass%. Grunke teaches nothing of the kind.

Grunke does not suggest that the average Al concentration can be or inherently will be reduced by the at least 29 mass% required to achieve Applicant’s currently claimed hydrogen absorption resistant Ti-Al alloy material. A 29 mass% decrease in Al content would appear to be a difference in kind. Optimization is generally the motivation to achieve some degree of improvement in a known property. *In re Aller*, 220 F.2d 454, 456 (CCPA 1955). Differences in kind require more than optimization of result effective variables. Differences in kind are generally unexpected. Scientists are motivated to improve upon prior art knowledge. *In re Peterson*, 315 F.3d 1325, 1330 (Fed. Cir. 2003).

For a finding of inherency, the reduction must not just be possible, it must necessarily result. *In re Oelrich*, 666 F.2d 578, 581 (CCPA 1981), teaches, “Inherency may not be established by probabilities or possibilities. Something that is inherent must inevitably be the result each and every time.” The fact that a certain result or property may occur is not sufficient to establish the inherency of that result or property. *In re Rijckaert*, 9 F.3d 1531, 1534 (Fed. Cir. 1993). “Inherency . . . may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.” *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999).

In the final action, the Examiner also found that close is sufficient for obviousness (OA, pp. 7-8, bridging ¶; p. 9, 1<sup>st</sup> full ¶). Applicant’s are now claiming subject matter which is not at all close to Grunke’s titanium alloy material. The “close enough” for obviousness rationale based on MPEP §2144.05 and *Titanium Metal Corp. of America v. Banner*, 778

F.2d 775 (Fed. Cir. 1985), simply does not apply when the ranges do not minimally overlap, the prior art teaches away from the claimed ranges for its different purposes, and Applicant's Specification instructs that the ranges the prior art suggests will not work for Applicant's purposes and do not produce a product with the properties Applicant requires. The currently claimed Al content of 0.8-6 mass% between Applicant's Ti-Al alloy and oxide layer is not close to the optimum Al content between Grunke's Ti-Al alloy and oxide layer for high temperature oxidation resistance.

The Examiner's rejections should be withdrawn.

Rejection of Claim 8 under 35 U.S.C. 103

Previously presented Claim 8 was rejected under 35 U.S.C. 103 over Miyamoto in view of Grunke, Lütjering, Yao, and Kobayashi (EP 0 816 007 A2, published January 7, 1998)(OA, p. 6, ¶ 9). This rejection also should be withdrawn.

Kobayashi does not cure any of the defects of the combined teachings of Miyamoto, Grunke, Lütjering, and Yao. Moreover, the Examiner has not explained why persons having ordinary skill in the art would have sought to reduce the higher Al concentration layer responsible for providing the heat resistance and oxidation resistance of Miyamoto's Ti-Al alloy material or Grunke's Ti-Al alloy material to provide protection against the heat and oxidation which reduces bond strength when welding a Ti-Al alloy to steel. The Examiner's conclusion of obviousness is not reasonably supported by the evidence and should be withdrawn.

Application No. 10/522,779  
Reply to Office Action of March 17, 2010

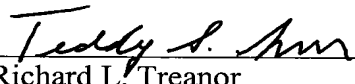
Applicant respectfully requests entry of this Amendment under 37 CFR 1.116. Then, for the reasons stated herein, Applicant's currently amended claims should be patentable over the applied prior art and in condition for allowance. Thus, early Notice of Allowance is respectfully requested.

Respectfully submitted,

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